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# (54) Apparatus for the application of a gasket inside closures comprising a cup, such as a screw-on and crown caps.

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## Description

This invention relates to an apparatus for the application of a gasket inside closures comprising a cup, such as screw-on and crown caps.

The technologies known up to now concerning the application of gaskets inside closures of the above mentioned type foresee, as a starting element, the extrusion of a belt having a suitable thickness and the blanking of disketts from such belt which are then inserted into cups for the completion of the closures. Through the known technologies there are not negligible inconveniences to be taken back, above all, to the fact that through the blanking a lot of scraps is produced; moreover, the flat configuration of the extruded belt does not allow to model the shape of the gasket for adapting them to the mouth of the containers they are to be applied at.

Known from EP-A-0,012,314 is an apparatus as defined in the precharacterizing part of claim 1, and a method as defined in the precharacterizing part of claim 9. Specifically, EP-A-0,012,314 teaches a section for heating closures, and turret for conveying closures below an extruder, which extrudes molten liner stock directly into the closure. The closure and the molten liners are then transported to a moulding machine which shapes and cools the liner/closure.

Also known from US-A-4,518,336 is an apparatus as defined in the precharacterizing part of claim 1, and a method as defined in the precharacterizing part of claim 9. Specifically, US-A-4,518,336, teaches a spoon which picks up a quantity of molten thermoplastic material from an extruder nozzle and is lowered into a metal cup, retained in grippers and heated by a ring. The plastic material is mechanically separated from the spoon by a tube, which is successively placed in communication with a conduit connected to pneumatic blowing means, for spreading the plastic material on the bottom of the cup.

EP-A-0,012,314 and US-A-4,518,336 both teach the moulding of a liner in a closure by direct introduction of molten thermoplastic material into the closure to be lined. While this is preferable to the technology requiring circular linings to be punched from an elongate strip, which causes a considerable amount of waste material, it is not devoid of problems.

Both of these prior apparatuses imply serious workability problems due to the inherent tackiness of the molten thermoplastic material, which tends to stick to the members for introducing the molten thermoplastic material into the closures, and to all parts of the closure itself during introduction.

Therefore, the technical task of this invention is to propose an apparatus by which the inconveniences of the known technologies are substantially reduced.

In accordance with one aspect of the invention, the above-mentioned task is attained by means of an apparatus as defined in claim 1.

In accordance with another aspect of the invention, the above-mentioned task is achieved by a method as defined in claim 9.

Advantageously, one may manufacture, in accordance with the invention, an apparatus wherein a third star wheel is provided to recycle empty individual mold means from the third rotary turret to the first rotary turret.

The invention permits one to obtain an apparatus including means for delivering closures to the third rotary turret.

The invention also permits one to obtain an apparatus including means for ejecting closures with imperfect liners.

According to one aspect of the invention there is provided an apparatus including means for removing closures with liners therein from the fourth star wheel.

According to another aspect of the invention there is provided an apparatus wherein individual mold means are individual shuttles having a cylindrical recess in their upper surface for forming the liner therein.

Expediently, an apparatus may be provided in accordance with the invention wherein the cylindrical recess has an upwardly conveying side wall.

The invention also advantageously provides a process for forming plastic liners and placing them in closures comprising:

a) placing a batch of softened thermoplastic material into an individual mold;

b) pressing the batch to form a plastic cylindrical closure liner;

c) removing the closure liner from the mold; and

d) placing the liner in a closure;

the process expediently including recycling the individual molds from step c) back to step a).

The invention also envisages a process including feeding both the closures and the individual molds into a rotary turret assembly where steps c) and d) are carried out.

In accordance with the invention the above-cited process may be provided including cooling the closure liner after step b) is completed and before step c) starts.

Also in accordance with the invention there is provided a process including moving the molds between the first, second, and third rotary turret assemblies by means of rotary star wheel assemblies.

Further features concerning this invention will be better explained from the following description of a preferred embodiment, illustrated by way of

example in the attached drawings, where:

Fig. 1 shows a plan view of the apparatus;

Fig. 2 is a vertical section view according to plan II-II of Fig. 1;

Fig. 3 is a vertical section view according to plan III-III of Fig. 1; and

Fig. 4 is a vertical section view according to plan IV-IV of Fig. 1.

Before analyzing the apparatus in detail, in order to make easier the understanding of its structure and working, hereafter there is preliminary description with reference to Fig. 1. In Fig. 1, 1 is the bed or base of the apparatus on which there are assembled the extruder 2 supplying the plastic material for the gasket or liner molding and three carousels or turrets 3,4,5 placed according to the vertices of an equilateral triangle and the three of them revolving in a clockwise direction A.

Between the carousels 3,4,5 there are interposed three devices or transfer star wheels 6,7,8 all of them revolving in direction B and tangential to the carousels themselves. The star wheel 9 that moves away complete closures also revolves in direction B. The transfer carousels and stars are peripherically provided with semicircular seats equidistant tangentially in which round element shuttles or individual molds 10 are inserted. On the upper face of each mold 10 there is a recess or hollow 11 for the molding of the plastic gaskets or liners 13. As one can see in Fig. 1, the shuttles 10 give rise to a closed train ring shaped proceeding zigzag alternatively in directions A and B following a trajectory that is clover shaped.

The apparatus works in the following way. In carousel 3, the softened plastic material supplied by the extruder 2 is deposited in small batches or pellets 12 in the hollows 11 of the shuttles 10. The star 6 provides to transfer the shuttles 10 to the forming carousel 4 where the batches, due to the action of suitable punches , are squeezed to take the shape of the hollow 11 thus giving rise to round gaskets 13. The squeezing of the batches is effected on a rotating angle of about 60° included between radius C and D where C is the radius joining the rotation center of carousel 4 with the tangent point of the carousel 4 with star 6.

From carousel 4 shuttles are taken by means of star 7 to carousel 5. Along the angular section which, from the tangent point of star 7 with carousel 5, symbolized by radius E, stretches for about 75° until radius F, suitable taking elements described more in detail hereinafter, extract the gasket 13 from the hollow 11 of the shuttles and insert them into cups or closures 14 fed in carousel 5 and supported at a height between gaskets 13 and shuttles 10.

The deposit of the gaskets inside the cups 14 is completed after a rotation of about 165° starting from the angular position E, in line with radius G. When this phase is carried out, the lined closures 15 (that is cups 14 containing gaskets 13) are transferred to the moving away star 9 and then guided to the collecting point.

With particular reference to Fig. 2, carousel 3 includes a horizontal and stationary plate 16 which is supported by means of a spacer ring 17, by a coupling 18 which rises from a bed or base 1 to which it is integrally attached. A vertical shaft 19 is revolvingly supported in coupling 18; to this shaft a cylindrical body 20 is rotatingly integrally attached. Shaft 19 receives motion from a motor assembly placed in bed 1 and not described here because it is completely traditional and unrelated to this invention.

A plate 21 is lowerly centered to body 20 and fixed coaxially to shaft 19; this plate provides along the periphery a plurality of recesses or semicylindrical seats 22 equidistant and opened towards the outside of, the plate 21 giving it the aspect of a cogwheel. Around plate 21, whose radial distance from the bottom of seats 22 is equal to the diameter of the seats themselves, stretches an edge or guide member 23 concentric to shaft 19. In seats 22 the shuttles 10 find room, externally, resting against edge 23 thus guiding them along a circular way. In body 20, in line with seats 22, there are provided vertical seats 24 in which there are sliding elements for taking the batches 12 of plastic material supplied by extruder 2 and introducing them into the hollows 11 of the shuttles. Such elements include a cylindrical element 25 axially pierced which, in the lower part, is provided with a sort of spoon 26 turned in the rotating direction A of carousel 3. The spoon 26 is obtained by cutting, on a longitudinal plan, a reduced tubular part of cylinder 25 so that the spoon takes the shape of a hollow semicylinder.

Axially to the cylinder 25, there is assembled a small pipe 27 whose lower end is opened and stretches into spoon 25 while the upper end is in communication by means of a connection 28 with a hole 29 made inside a guide 30. Guide 30 is placed within a seat 31 of the cylindrical element 25 in order to slide parallel to the rotation axis of the carousel. The cylindrical element 25 is prevented from rotating in seat 24 by means of key 32 sliding in a slot 33 of body 20. The cylindrical element 25 is vertically operated by a cam 34 in which there is a pin 35 cantilevered assembled on its top. In the proper sequences the small pipe 27 is operated, with respect to the cylindrical element 25, by means of a further cam 36 where there is inserted a pin 37 and supported at the top of the guide 30. The cams 34 and 36 are annular shaped on the external surface of a drum 38 that is stationary with respect to the carousel and installed co-

axially on the shaft 19 over body 20. Hole 29, made in guide 30, is designed to be set selectively in communication with the first radial duct 39 and with a second radial duct 40 in body 20 and opening towards the outside of body 20. The ducts 39 and 40 are joinable respectively by a sucking or vacuum source and a blower or air pressure source. To this purpose the ducts 39 and 40 exit on the upper face of body 20 and are controlled by a ring 41 set in the drum 38 with the interposition of sealing rings. Moreover, in drum 38 there are, angularly offset, relevant pipes 42 for the connection with the vacuum and air pressure sources. Only one is shown in the drawing.

Due to the cams 34 and 36 the spoon 26 and the internal small pipe 27 are lifted and then lowered with respect to the shuttles 10. In the lifted position between spoon 26 and the opposite shuttle 10 there is inserted the nozzle 43 of the extruder head 2. Nozzle 43 shows an orifice 44 turned vertically upwards and arranged to extrude plastic material to be shaved by the spoon 27 when it passes over it for picking up the batch or pellet 12. The transfer star 6 includes a plate 45 coplanar with plate 21 keyed at the top of a shaft 46 revolvingly supported vertically in bed 1 and kinematically joined with shaft 19 so that plates 45 and 21 have the same tangential speed. On the periphery of plate 45 there are provided semicircular seats 47 which together with an edge or guide 48 direct the shuttles received by carousel 3 to carousel 4.

Carousel 4 (see figure 3) includes a coupling 49 installed in bed or base 1 in which it revolvingly supports shaft 50 operated by the same motor assembly which operates shaft 19. On shaft 50, by means of a key 51, is keyed a drum 52 which in the lower part, is placed over coupling 49 and is externally provided with two circular collars 53,54. Collar 53 has the upper face coplanar with the surface of plate 16 and, on it, there is fixed a crown or plate 55 having semicircular equidistant seats 56 for the housing of the shuttles 10 coming from the transfer star 6. At least for an initial section starting from the angular position marked with radius C, around crown 55 an edge 57 is provided which holds the shuttles in the relevant seats 56.

In collars 53,54 there are provided holes 58-59 which are in line vertically with seats 56. In each hole 59 a tang or lifter assembly 60 is slidably guided vertically and prevented from revolving by a key 61 inserted in a slot axial to hole 59. At the far bottom of tang 60 there is mounted a pin 62 having its rotation axis radial with reference to shaft 50. Pin 62 rolls on an annular cam 63 which is fixed on bed 1 with the interposition of a spacer bearing 64. The upper end of tang 60 is provided with a coaxial shank 65 having a smaller diameter making a bearing shoulder for a spring 66. Spring 66 operates on a bushing 67 placed over shank 65 and held by a pin 68 which extends through the diameter of the shank. On top of bushing 67 there is provided a recess for the housing of a magnet 67a for the holding of shuttles 10. The opposite ends of pin 68 are inserted in slots 69 of bushing 67 which slots are axially extended in order to allow the bushing 67 to slide on the shank 65 against the transmission action made by spring 66. Cam 63 is made in such a way that the top of the bushing 67 is coplanar with the upper face of plate 16 along the arc between the angular position C and D in order to receive the shuttles from star 6 then project from the same face along the arc between the angular position D and the angular position marked with radius H and then lower again on the coplanar height with plate 16 before reaching the tangent point with transfer star 7.

On drum 52, and rigidly connected therewith, there is placed a flange 70 provided with cylindrical seats or openings 75 in vertical alignment with bushing 67 and which supports hollow punch assemblies 71. Each punch 71 includes a tubular part 72 and a hollow head 73. The tubular part 72 is inserted sealingly in a connector 74 housed in a cylindrical seat 75 coaxial to the relevant hole 58. In the tubular part 72 is placed concentric therewith a small pipe 76 which ends in the hollow head 73. The small pipe 76 is connected with a duct 77 of the flange 70 through which it is lead to the hollow head 73 a heating fluid or a coolant whose return comes through the hollow space between the small pipe itself and the tubular part 72 and a second duct 78 of flange 70.

On head 73, a ring 79 is guided and it is provided, on one side, with an internal projection that is seated on top of head 73. Ring 79 has a length such as to project below the lower edge of head 73 and an outside diameter equal to the one of shuttles 10. Between ring 79 and flange 70 a spring 80 is interposed keeping the ring pushed downwards.

As previously stated, in carousel 4 there is the molding of the gaskets 13 by means of the lifting of the shuttles 10 due to bushing 67 against punches 71 and resulting squeezing of the batches 12 of plastic material contained inside hollows 11. The temperature of the molding of gaskets 13 is adjusted by the introduction of liquid into the hollow punches 71 through ducts 77,78. For example, if the plastic material of the batches is made of PVC (polyvinyl chloride) the punches will be duly heated through the introduction of hot water. Instead, in case the plastic material is PE (polyethylene) or EVA (ethylenevinylacetate) the punches will be cooled down by the introduction of cold water. When the molding of the gasket is finished, shut-

tles pass to the transfer star 7 which is completely the same as transfer star 6. In fact, also this one includes a plate 81 coplanar with plate 16 and provided with semicircular seats 82 distributed along the periphery. Plate 81 is revolvingly integral to a shaft 83 and all around it along the section stretching from carousel 4 to carousel 5 in direction B there is provided an edge or guide 84 that is concentric and which keeps the shuttles in seats 82 up to their introduction into carousel 5 where gaskets are introduced into cups or closures 14.

Carousel 5 (see Figure 4) is composed of a coupling 85 installed on bed 1 and acting as a revolving support for a vertical shaft 86 operated by the same motor elements which power also shafts 19,46,50, and 83. On coupling 85 there is centered a circular flange 87 in whose periphery there is a plurality of studs 88 parallel to shaft 86. On top of studs 88 there is rigidly supported a stationary guide 89 whose shape is concentric to shaft 86. Guide 89 stretches from an angular position I (see Figure 1) of carousel 5 where in line with it the cups 14 are fed which are going to receive the gaskets up to the tangent point with the moving away star 9 which coincides with radius K. In the lower part of guide 89 there is provided a channel 90 open towards the inside and closed downwards by a circular disk 91. Disk 91 is centered and resting on a shoulder 92 of shaft 86 together with a drum 93 standing above. Disk 91 and drum 93 are rotatingly coupled to shaft 86 by means of a ring nut and counter ring nut 94 screwed on a threaded part of shaft 86. Note that the upper face of disk 91 and guide 89 are respectively coplanar with the upper face of plate 16, and with the surface of the conveyor 95 for feeding cups 14. Moreover, to disk 91 are rotatingly fixed two plates 96,97 placed one on top of the other which are provided with peripherally equidistant and opposite semicircular seats 98,99. Plate 96 has its lower surface coplanar with the upper Surface of guide 89. Seats 98,99 are in vertical line and around them there is provided concentrically an edge 100 fixed on guide 89 and a wall 101 of the channel 90 for respectively guiding shuttles 10 and cups 14 during the revolving of the carousel. Further studs 102 are placed along the angular part included between the radius E and I and support an edge of guide 103 whose internal wall lies in the same cylindrical plane as wall 101.

In drum 93, in vertical line with the seats 98,99 therebelow, there are provided holes 104 where the taking elements marked on the whole with 105 are guided and each of them is composed of a tube 106 sliding in a relevant hole 104 and of a shank or rod 107 sliding inside tube 106. At the upper end of tube 106 and of shank 107 there are assembled cantilevered idle pins 108,109 inserted in cams 110,111 which are annular shaped in a cylindrical body 112 that is stationary with reference to the carousel in which shaft 86 is revolvingly supported with the interposition of revolving bearings 113,114.

There is a key 115 on shank 107 which crosses the tube 106 in line with a slot 116 that is vertically elongated. Key 115 projects outside through a slot 117 that is also vertically elongated from drum 93 so that tube 106 and shank 107, while they can slide axially one on the other in hole 104, they are prevented from rotating. The lower end of the shank 107 makes a sort of bell 118 which provides a hollow 119 communicating with a duct 120. Duct 120 stretches for a certain section along the axis of shank 107 and thereafter radially through the key 115 to flow to the external surface of drum 93. An annular connector 121 of flexible material connects duct 120 with a duct 122 provided radially in drum 93 and connected by means of sucking or vacuum elements through a ring 123 sealingly enclosed in body 112 and providing a duct 124.

The lower end of tube 106 is provided with a bushing 125 which wraps around bell 118. Bell 118 and bushing 125 have such a diameter that when the taking element 105 is completely lowered, they rest respectively on the gasket 13 and on the edge of the shuttled 10 surrounding the hollow 11.

At the exit of carousel 5, while closures 15 are fed into the moving away star 9, shuttles 10 are introduced into star 8 which transfers them into the batching carousel 3. The moving away star 9 includes a plate 126 installed on top of a shaft 127 and lying at the same height as plate 96. Along the periphery, plate 126 is provided with semicircular recesses 128 which in cooperation with an edge 129 concentric to shaft 127 guide the closures 15 towards the moving away conveyor 130. A hopper 131 is provided where possible defective closures are unloaded. Similarly to stars 6 and 7, even star 8 includes a plate 132 tangent to both carousel 5 and 3 and provided with peripheral semicircular seats 133. Plate 132 is integrally fixed to shaft 134 which lies at the height of plate 97 for receiving from that plate the shuttles 10 and to transfer them again to carousel 3 in cooperation with edge 135.

The way each of the single carousels 3,4,5 work is as follows. When the carousel 3 revolves, the cylindrical elements 25 are operated in sequence through cam 34, between a lifted position and a lowered one. In the lifted position (on the right of Figure 2) in correspondence with position marked with L on Figure 1 the cylindrical elements 25 pass over the nozzle 43 and pick up, by means of spoon 26 a batch or pellet 12 of plastic material ejected in the meantime from the orifice 44 of extruder 2. During such a phase, the small pipe 27 relevant to the spoon which makes the taking, is lifted with reference to the spoon itself and is in

communication through the relevant duct 39 with the pneumatic sucking or vacuum means. Spoon 26 is then depressed thus allowing the downward movement of it along with the taken batch of plastic material. Then, the cylinder 25 is operated by cam 34 lowers down to move spoon 26 into the hollow 11 of shuttle 10. At the same time the small pipe 27 is operated by cam 36 moves downward. The travel of the small pipe continues with reference to the cylindrical element so as to cause the detachment of the batch or pellet 12 from the spoon and the connection of the small pipe with duct 40 through which it is connected to pneumatic blowing means. In such a way, the detached batch 12 of plastic material in correspondence of the angular position marked with M of Figure 1 is deposited in hollow 11 of shuttle 10 that is below.

The shuttles 10 that are provided with batch 12, are tangentially introduced into seats 56 of carousel 4 by means of star 6. During the passage between the angular positions C and D, operated by cam 63, the shuttles are lifted by bushing 67 and brought peripherally in contact with ring 79 which together with hollow head 73 closes the hollow 11 in the upper part of the shuttles. The further lifting of the shuttles (which stay attached at bushings 67 due to the magnets 67a) causes the squeezing of batch 12 which, in spreading, occupies all of the hollow 11 taking the shape and giving rise to a round gasket or liner 13. During the revolving from the angular position D until position H there comes the stabilization of the plastic material in hollow 11. When position H is overtaken, bushing 67 is again lowered thus allowing the shuttles to enter again the seats 56 and then to pass into star 7 and to be transferred into the final carousel 5 where they are inserted in seats or recesses 99.

For the portion before the angular position E, the taking elements or lifter assemblies 105 are lowered on the shuttles by cams 110, 111. More precisely, the lowering of elements 105 is controlled in such a way that in correspondence with the angular position E that the bush 125 is resting in the periphery of the relevant shuttle and the bell 118 on gasket 13. Thereafter, the vacuum is created in hollow 119, causing the adhesion of gasket 13 to bell 118. In order to avoid the gasket entering the hollow 120 due to the sucking effect the lower closing of the bell can be provided with a pierced disk which allows application of the vacuum to the gaskets. The evacuation of bell 118 is operated in connecting the hollow 119 with the vacuum elements 120-122. As soon as the gasket is firmly attached at the bell, due to the effect of cam 11, the shank 107 is lifted so as to cause the detachment of the gasket 13 from the shuttle 10 which remains held in seat 99 by bushing 125 which is still in the lowered position. Thereafter, following the movement of cam 110, the tube 106, and also bushing 125, are lifted together with shank 107 until gasket 13 reaches a height standing over plate 96. These phases come along the rotation angle of the carousel included between radius E and I. During the further rotation of carousel 5 between I and G, the shank 107 moved by cam 111 goes down again bringing the bell 118 with gasket 13 inside the cups or closures 14 that in the meanwhile have been introduced by the conveyor 95 into seats 98 and slide between the guide 100 and are held by the plate 96. When the bottom of the cups is reached, the vacuum stops and the gasket remains seated in the bottom of the cups. While closures 15, complete with gaskets, go on to the moving away star 9, the shuttles 10 are moved again into star 8 which transfer them to carousel 3 where the cycle begins again and follows the way above described. The fact that the time of molding for gaskets is sufficiently long in order to grant a perfect molding of the gaskets, gives relevant advantages to the apparatus. The apparatus can be provided with sensors suitable to check possible gaskets imperfections and to operate the rejection of defective closures into the unloading hopper 131. Advantageously, the hollows 11 of shuttles 10 have peripheral walls converging upwards, for a more effective retention of the gasket that could become curly, due to internal tensions.

The above described apparatus is subject to numerous changes and modifications all entering the inventive idea as set out in the claims in particular for making better the working of the plastic material. For example, it is possible to provide along the way of the shuttles suitable heating elements which are able to influence the temperature of the plastic material in the shuttles.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

## Claims

1. An apparatus for forming plastic liners and placing them in closures comprising;
   - means (2) for supplying softened thermoplastic material, and
   - means for forming, with said softened thermoplastic material, a closure liner (13) in a closure (14),

   characterized in that said means for forming comprise;

- individual mold means (10) for receiving individual batches (12) of thermoplastic material,
- a first rotary turret (3) carrying the individual mold means (10) and having means (70-80) for forming and depositing the individual batches (12) in the individual mold means (10),
- a second rotary turret (4) having means (67, 71) for pressing the batches (12) into plastic cylindrical closure liners (13),
- a third rotary turret (5) having means (24-26) for removing the closure liners (13) from the individual mold means (10) and placing the closure liners (13) into closures (14) carried by the third rotary turret (5) and,
- means (6, 7) for transferring the individual mold means (10) between the first, second, and third rotary turrets (3, 4, 5).

2. Apparatus according to claim 1, characterized in that the means (6, 7) for transferring the individual mold means (10) between the first, second, and third rotary turrets (3, 4, 5) comprises a first and a second rotary transfer star wheel (6, 7).

3. Apparatus according to claim 1 or 2, characterized in that it includes a fourth star wheel (9) for removing closures (14) with liners (13) therein from the third rotary turret (5).

4. Apparatus according to claim 1, characterized in that the means for forming and depositing individual batches includes a base (1) with a hollow coupling (18) having a cylindrical shaft (19) extending therethrough, a circular table (16) attached to the coupling (18) for supporting the individual mold means (10), a plate (21) coupled to the cylindrical shaft (19) and having recesses (22) in the outer periphery receiving the individual mold means (10), a cylindrical body (20) coupled to the shaft (19) and having a vertical opening (24) above each individual mold means (10), and a sliding element (26) in each opening (24) for taking softened thermoplastic from an extruder (2) and forming the thermoplastic into the individual batch (12) and subsequently depositing the individual batch (12) in an individual mold means (10).

5. Apparatus according to claim 4, characterized in that the sliding element (26) includes an enlarged cylindrical section (25) axially slidable in the opening (24), a reduced semicylindrical portion at the lower end of the enlarged cylindrical section (25) for forming thermoplastic material into a batch (12), a pipe (27) axially slidable in and extending through the enlarged and reduced cylindrical sections (25), cam means (36) for raising and lowering the pipe (27), vacuum means connected to the pipe (27) when it is in a raised position, and air pressure means connected to the pipe (27) when it is in a lowered position.

6. Apparatus according to claim 1, characterized in that the means for pressing the batches (12) into plastic cylindrical closure liners (13) includes a base (1) with a hollow coupling (49) with a cylindrical shaft (50) extending therethrough, a drum (52) fixed to the shaft (50) and having a lower (54) and an upper (53) circular collar provided with a plurality of cylindrical openings (58, 59) therein, the upper collar (53) having a crown (55) on the upper surface providing recesses (56) normally centered over the openings to receive the individual molds (10), the lower collar (54) providing a plurality of cylindrical openings (59) vertically aligned with the openings (58) in the upper collar (53), a plurality of cylindrical lifter assemblies (60) slidably mounted in the openings (58, 59) for moving the individual molds (10) upwardly and downwardly, a circular flange member (70) fixed to the upper end of the shaft (50) and having a plurality of hollow punch members (71), each punch member (71) being mounted above an opening (58) in the upper collar member (53) and adapted to compress the individual batches (12) of plastic material inside each mold member (10) to form a flat, circular closure liner (13) in each mold member (10) when each lifter assembly (60) is moved upwardly, and an actuator assembly (62, 63) on the lower end of each lifter assembly (60).

7. Apparatus according to claim 1, characterized in that the means for transferring the individual mold means (10) includes a base (1) with a hollow coupling (85) with a cylindrical shaft (86) extending therethrough, a drum (93) mounted on the shaft for rotation therewith, a disk (91) attached to the lower end of the drum (93), a first plate member (97) mounted on the upper surface of the disk (91) and having recesses (99) in the periphery to receive individual molds (10), a second plate (96) mounted on the top of the first plate (97) and having recesses (98) to receive closures (14), guide members (88, 89, 100, 101) fixed to the hollow coupling (85) and positioned opposite the recesses (98, 99) in the first and second plate members (97, 96) to retain the mold members

(10) and the closures (14) within the recesses (99, 98),, a plurality of vertical openings (104) in the outer portion of the drum 93) vertically aligned with said recesses (98, 99), a liner lifter assembly (105) slidably mounted in each opening (104) for lifting the liners (13) from the individual molds (10) and placing the liners (13) into closures (14), and actuating means (110-114) for raising and lowering each lifter assembly (105).

8. Apparatus according to claims 1 and 7, characterized in that each lifter assembly (105) includes an outer tube (106) having a lower end adapted to seat on an individual mold (10), the upper end of the tube (106) being coupled to means (108, 110) for raising and lowering the tube (106), a cylindrical shank (107) slidably mounted in the tube (106) and having a lower end adapted to abut the liner (13) in the mold (10), the upper end of the shank (107) coupled to means (109, 111) for raising and lowering the shank (107), means for applying a vacuum to the lower end of shank (107) when the liner (13) is removed from the mold (10), and means to apply air pressure to the lower end of the shank (107) when the liner (13) is placed inside the closure (14).

9. A process for forming plastic liners and placing them in closures comprising the steps of:
   - supplying softened thermoplastic material, and
   - forming, with said softened thermoplastic material, a closure liner (13) in a closure (14) , characterized in that it further comprises the intermediate steps of,
     a) placing a batch (12) of softened thermoplastic into an individual mold (10),
     b) pressing the batch (12) into the individual mold (10) to form a plastic cylindrical closure liner (13),
     c) removing the closure liner (13) from the individual mold (10), and
     d) placing the individually formed liner (13) in a closure (14).

10. Process according to claim 9, characterized in that step a) is carried out at a first rotary turret (3), step b) is carried out at a second rotary turret (4), and step c) is carried out at a third rotary turret (5).

**Patentansprüche**

1. Vorrichtung zum Formen von Kunststoffeinlagen und zum Einsetzen der Einlagen in Verschlüsse, mit
   - einer Einrichtung (2) zum Zuführen von weichgemachtem thermoplastischem Material, sowie
   - einer Einrichtung zum Formen einer Verschlußeinlage (13) in einem Verschluß (14) aus dem weichgemachten thermoplastischen Material,

   dadurch gekennzeichnet, daß die Einrichtung zum Bilden der Verschlußeinlage aufweist:
   - einzelne Formmittel (10) zur Aufnahme von einzelnen Füllungen (12) aus thermoplastischem Material,
   - einen ersten Revolverkopf (3), der die einzelnen Formmittel (10) hält und Mittel (70-80) aufweist, um die einzelnen Füllungen (12) in den einzelnen Formmitteln (10) zu formen und abzusetzen,
   - einen zweiten Revolverkopf (4) mit Mitteln (67, 71) zum Pressen der Füllungen (12) zu zylindrische Verschlußeinlagen (13) aus Kunststoff,
   - einen dritten Revolverkopf (5) mit Mitteln (24-26), um die Verschlußeinlagen (13) aus den einzelnen Formmitteln (10) zu entfernen und sie in Verschlüsse (14) einzusetzen, die von dem dritten Revolverkopf (5) gehalten werden, sowie
   - Mittel (6, 7) zur Übergabe der einzelnen Formmittel (10) zwischen dem ersten, dem zweiten und dem dritten Revolverkopf (3, 4, 5).

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Mittel (6, 7) zur Übergabe der einzelnen Formmittel (10) zwischen dem ersten, dem zweiten und dem dritten Revolverkopf (3, 4, 5) ein erstes und ein zweites drehbares Übergabesternrad (6, 7) aufweisen.

3. Vorrichtung nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß sie ein viertes Sternrad (9) aufweist, um die Verschlüsse (14) mit den Einlagen (13) darin aus dem dritten Revolverkopf (5) zu entfernen.

4. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Einrichtung zum Formen und Absetzen von einzelnen Füllungen eine Basis (1) mit einer hohlen Kupplung (18) und einer zylindrischen Welle (19) aufweist, die sich durch die Kupplung (18) erstreckt, einen kreisförmigen Tisch (16), der zum Stützen der einzelnen Formmittel (10) an der Kupplung (18) befestigt ist, eine Platte (21), die an die zylindrische Welle (19) gekoppelt ist und am äußeren Umfang Ausnehmungen (22) zur Aufnahme

der einzelnen Formmittel (10) aufweist, einen zylindrischen Körper (20), der an die Welle (19) gekoppelt ist und über jedem einzelnen Formmittel (10) eine vertikale Öffnung (24) aufweist, sowie in jeder Öffnung (24) ein Gleitelement (26), um das weichgemachte thermoplastische Material aus einem Extruder (2) aufzunehmen und es zu einer Einzelfüllung (12) zu formen, sowie um danach die Einzelfüllung (12) in ein einzelnes Formmittel (10) abzusetzen.

5. Vorrichtung nach Anspruch 4, dadurch gekennzeichnet, daß das Gleitelement (26) einen vergrößerten zylindrischen Abschnitt (25) aufweist, der axial in der Öffnung (24) verschiebbar ist, einen reduzierten halbzylindrischen Teil am unteren Ende des vergrößerten zylindrischen Abschnitts (25), um thermoplastisches Material zu einer Füllung (12) zu formen, ein Rohr (27), das axial in dem vergrößerten und dem reduzierten zylindrischen Abschnitt (25) verschiebbar ist und sich durch beide Abschnitte hindurch erstreckt, Nockenmittel (36) zum Anheben und Absenken des Rohrs (27), Vakuummittel, die mit dem Rohr (27) verbunden sind, wenn es sich in einer angehobenen Position befindet, sowie Luftdruckmittel, die mit dem Rohr (27) verbunden sind, wenn es sich in einer abgesenkten Position befindet.

6. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Einrichtung zum Pressen der Füllungen (12) zu zylindrischen verschlußeinlagen (13) aus Kunststoffmaterial eine Basis (1) mit einer hohlen Kupplung (49), durch die sich eine zylindrische Welle (50) erstreckt, eine Trommel (52), die an der Welle (50) befestigt ist und einen oberen (54) und einen unteren (53) kreisförmigen Bund aufweist, der mit mehreren zylindrischen Öffnungen (58, 59) versehen ist, wobei der obere Bund (53) an seiner oberen Fläche einen Kranz (55) mit Ausnehmungen (56) aufweist, die normal über den Öffnungen zentriert sind, um die einzelnen Formen (10) aufzunehmen, und wobei der untere Bund (54) mehrere zylindrische Öffnungen (59) aufweist, die vertikal mit den Öffnungen (58) in dem oberen Bund (53) fluchtend ausgerichtet sind, mehrere zylindrische Aushebeanordnungen (60), die in den Öffnungen (58, 59) verschiebbar gelagert sind, um die einzelnen Formen (10) nach oben und nach unten zu bewegen, ein kreisförmiges Flanschelement (70), das an dem oberen Ende der Welle (50) befestigt ist und mehrere hohle Stanzelemente (71) aufweist, wobei jedes Stanzelement (71) über einer Öffnung (58) in dem oberen Bundelement (53) montiert ist und in der Lage ist, die Einzelfüllungen (12) aus Kunststoffmaterial in jedem Formelement (10) zusammenzudrucken, so daß in jedem Formelement (10) eine flache, kreisförmige Verschlußeinlage (13) ausgebildet wird, wenn jede Aushebeanordnung (60) nach oben bewegt wird, sowie eine Betätigungsanordnung (62, 63) an dem unteren Ende jeder Aushebeanordnung (60).

7. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Einrichtung zur Übergabe der einzelnen Formmittel (10) eine Basis (1) mit einer hohlen Kupplung (85) umfaßt, durch die sich eine zylindrische Welle (86) erstreckt, eine Trommel (93), die an der Welle mit ihr drehbar montiert ist, eine an dem unteren Ende der Trommel (93) befestigte Scheibe (91), ein erstes Plattenelement (97), das an der oberen Fläche der Scheibe (91) montiert ist und am Umfang Ausnehmungen (99) zur Aufnahme der einzelnen Formen (10) aufweist, eine zweite Platte (96), die auf der ersten Platte (97) montiert ist und Ausnehmungen (98) zur Aufnahme von Verschlüssen (14) aufweist, Führungselemente (88, 89, 100, 101), die an der hohlen Kupplung (85) befestigt sind und gegenüber den Ausnehmungen (98, 99) in dem ersten und dem zweiten Plattenelement (97, 96) positioniert sind, um die Formelemente (10) und die Verschlüsse (14) in den Ausnehmungen (99, 98) zu halten, mehrere vertikale Öffnungen (104) im äußeren Abschnitt der Trommel (93), die mit den Ausnehmungen (98, 99) vertikal fluchtend ausgerichtet sind, eine Einlageaushebeanordnung (105), die in jeder Öffnung (104) verschiebbar gelagert ist, um die Einlagen (13) aus den einzelnen Formen (10) auszuheben und sie in Verschlüsse (14) einzusetzen, sowie Betätigungsmittel (110-114) zum Anheben und Absenken jeder Aushebeanordnung (105).

8. Vorrichtung nach den Ansprüchen 1 und 7, dadurch gekennzeichnet, daß jede Aushebeanordnung (105) ein äußeres Rohr (106) mit einem unteren Ende aufweist, das auf einer einzelnen Form (10) sitzen kann, wobei das obere Ende des Rohrs (106) mit Mitteln (108, 110) zum Anheben und Absenken des Rohrs (106) gekoppelt ist, einen zylindrischen Schaft (107), der in dem Rohr (106) verschiebbar gelagert ist und ein unteren Ende aufweist, das an die Einlage (13) in der Form (10) angrenzen kann, wobei das obere Ende den Schaftes (107) mit Mitteln (109, 111) zum Anheben und Absenken des Schaftes (107) gekoppelt ist, Mittel zum Aufbringen eines Vakuums auf das untere Ende des Schaftes (107), wenn die Einlage

(13) aus der Form (10) entfernt wird, sowie Mittel zum Aufbringen von Luftdruck auf das untere Endes des Schaftes (107), wenn die Einlage (13) in den Verschluß (14) gesetzt wird.

9. Verfahren zum Formen von Kunststoffeinlagen und zum Einsetzen der Einlagen in Verschlüsse mit folgenden Schritten:
   - Zuführen von weichgemachtem thermoplastischem Material, und
   - Formen einer Verschlußeinlage (13) in einem Verschluß (14) aus diesem weichgemachten thermoplastischem Material, dadurch gekennzeichnet, daß es außerdem die folgenden Zwischenschritte aufweist:

     a) Setzen einer Füllung (12) aus weichgemachtem thermoplastischem Material in eine einzelne Form (10),

     b) Pressen der Füllung (12) in die einzelne Form (10), um eine zylindrische Verschlußeinlage (13) aus Kunststoff zu bilden,

     c) Entfernen der Verschlußeinlage (13) aus der einzelnen Form (10), sowie

     d) Einsetzen der einzeln geformten Einlage (13) in einen Verschluß (14).

10. Verfahren nach Anspruch 9, dadurch gekennzeichnet, daß der Schritt a) an einem ersten Revolverkopf (3) durchgeführt wird, daß Schritt b) an einem zweiten Revolverkopf (4) durchgeführt wird, und daß Schritt c) an einem dritten Revolverkopf (5) durchgeführt wird.

**Revendications**

1. Dispositif pour le formage de joints en matière plastique et pour leur placement sur des organes de fermeture, comprenant :
   - un moyen (2) pour la fourniture d'une matière thermoplastique ramollie et
   - un moyen pour le formage, avec ladite matière thermoplastique ramollie, d'un joint de fermeture (13) sur un organe de fermeture (14),

   dispositif caractérisé en ce que ledit moyen de formage comprend :
   - un moyen individuel de moule (10) pour la réception de lots individuels (12) en matière thermoplastique;
   - une première tourelle rotative (3) portant le moyen individuel de moule (10) et possédant des moyens (70 à 80) pour le formage et le dépôt des lots individuels (12) dans le moyen individuel de moule (10);
   - une seconde tourelle rotative (4) possédant des moyens (67, 71) pour le pressage des lots (12) en joints cylindriques en matière plastique d'organe de fermeture (13);
   - une troisième tourelle rotative (5) possédant des moyens (24 à 26) pour l'enlèvement des joints de fermeture (13) du moyen individuel de moule (10) et pour le placement des joints de fermeture (13) dans des organes de fermeture (14) portés par la troisième tourelle rotative (5) et
   - des moyens (6, 7) pour le transfert du moyen individuel de moule (10) entre les première, seconde et troisième tourelles rotatives (3, 4, 5).

2. Dispositif selon la revendication 1, caractérisé en ce que les moyens (6, 7) de transfert du moyen individuel de moule (10) entre les première, seconde et troisième tourelles rotatives (3, 4, 5) comprend une première et une seconde roues rotatives en étoile de transfert (6, 7).

3. Dispositif selon la revendication 1 ou 2, caractérisé en ce qu'il comprend une quatrième roue en étoile (9) pour l'enlèvement des organes de fermeture (14) muni des joints (13) de la troisième tourelle rotative (5).

4. Dispositif selon la revendication 1, caractérisé en ce que le moyen pour le formage et le dépôt des lots individuels comprend une base (1) munie d'un accouplement creux (18) possédant un arbre cylindrique traversant (19), une table circulaire (16) fixée à l'accouplement (18) pour supporter le moyen individuel de moule (10), une plaque (21) couplée à l'arbre cylindrique (19) et munie de creux (22) sur la périphérie externe recevant le moyen individuel de moule (10), un corps cylindrique (20) couplé à l'arbre (19) et muni d'une ouverture verticale (24) au dessus de chaque moyen individuel de moule (10) et un élément coulissant (26) dans chaque ouverture (24) pour extraire la matière thermoplastique ramollie d'un dispositif d'extrusion (2) et pour le formage de la matière thermoplastique en lot individuel (12) puis le dépôt du lot individuel (12) dans un moyen individuel de moule (10).

5. Dispositif selon la revendication 4, caractérisé en ce que l'élément coulissant (26) comprend une section cylindrique élargie (25) coulissant axialement dans l'ouverture (24), une partie semi-cylindrique réduite à l'extrémité inférieure de la section cylindrique élargie (25) pour le formage de la matière thermoplastique en un

lot (12), un tube (27) coulissant axialement dans et s'étendant à travers les sections cylindriques élargie et réduite (25), un moyen de came (36) pour soulever et abaisser le tube (27), un moyen à dépression raccordé au tube (27) lorsqu'il est en position soulevée et un moyen pneumatique raccordé au tube (27) lorsqu'il est en position abaissée.

6. Dispositif selon la revendication 1, caractérisé en ce que le moyen de pressage des lots (12) en joints cylindriques en matière plastique de fermeture (13) comprend une base (1) munie d'un accouplement creux (49) comprenant un arbre cylindrique traversant (50), un tambour (52) fixé à l'arbre (50) et possédant des colliers circulaires inférieur (54) et supérieur (53) munis de plusieurs ouvertures cylindriques (58, 59), le collier supérieur (53) possédant une couronne (55) sur la surface supérieure présentant des creux (56) centrés normalement au dessus des ouvertures pour recevoir les moules individuels (10), le collier inférieur (54) possédant plusieurs ouvertures cylindriques (59) alignées verticalement avec les ouvertures (58) du collier supérieur (53), plusieurs ensembles cylindriques de poussoir (60) montés coulissants dans les ouvertures (58, 59) pour déplacer les moules individuels (10) vers le haut et vers le bas, une pièce circulaire de flasque (70) fixée à l'extrémité supérieure de l'arbre (50) et possédant plusieurs pièces creuses de poinçon (71), chaque pièce de poinçon (71) étant montée au dessus d'une ouverture (58) de la pièce de collier supérieur (53) et prévue pour presser les lots individuels (12) en matière plastique à l'intérieur de chaque pièce de moule (10) pour former un joint circulaire plat (13) de fermeture dans chaque pièce de moule (10) lorsque chaque ensemble de poussoir (60) est déplacé vers le haut et un ensemble d'actionnement (62, 63) sur l'extrémité inférieure de chaque ensemble de poussoir (60).

7. Dispositif selon la revendication 1, caractérisé en ce que le moyen de transfert du moyen individuel de moule (10) comprend une base (1) munie d'un accouplement creux (85) possédant un arbre cylindrique traversant (86), un tambour (93) monté à rotation sur l'arbre, un disque (91) fixé à l'extrémité inférieure du tambour (93), une première pièce de plaque (97) montée sur la surface supérieure du disque (91) et possédant des creux (99) sur la périphérie pour recevoir les moules individuels (10), une seconde plaque (96) montée au sommet de la première plaque (97) et possédant des creux (98) pour recevoir les organes de fermeture (14), des pièces de guidage (88, 89, 100, 101) fixées sur l'accouplement creux (85) et placées opposées aux creux (98, 99) des première et seconde pièces de plaque (97, 96) pour maintenir les pièces de moule (10) et les organes de fermeture (14) dans les creux (99, 98), plusieurs ouvertures verticales (104) dans la partie externe du tambour (93) alignées verticalement avec lesdits creux (98, 99), un ensemble de poussoir de joint (105) monté coulissant dans chaque ouverture (104) pour soulever les joints (13) à partir des moules individuels (10) et placer les joints (13) dans les organes de fermeture (14) et des moyens d'actionnement (110 à 114) pour soulever et abaisser chaque ensemble de poussoir (105).

8. Dispositif selon les revendications 1 et 7, caractérisé en ce que chaque ensemble de poussoir (105) comprend un tube externe (106) possédant une extrémité inférieure prévue pour porter sur un moule individuel (10), l'extrémité supérieure du tube (106) étant couplée à des moyens (108, 110) pour soulever et abaisser le tube (106), un corps cylindrique (107) monté coulissant dans le tube (106) et possédant une extrémité inférieure butant sur le joint (13) dans le moule (10), l'extrémité supérieure du corps (107) étant couplée aux moyens (109, 111) pour soulever et abaisser le corps (107), un moyen pour appliquer une dépression à l'extrémité inférieure du corps (107) lorsque le joint (13) est enlevé du moule (10) et un moyen pour appliquer une pression d'air à l'extrémité inférieure du corps (107) lorsque le joint (13) est placé à l'intérieur de l'organe de fermeture (14).

9. Procédé pour le formage de joints en matière plastique et leur placement dans des organes de fermeture, comprenant les étapes suivantes:
   - la fourniture d'une matière thermoplastique ramollie et
   - le formage, avec ladite matière thermoplastique ramollie, d'un joint de fermeture (13) dans un organe de fermeture (14),

   procédé caractérisé en ce qu'il comprend, de plus, les étapes intermédiaires suivantes :
   a) le placement d'un lot (12) en matière thermoplastique ramollie dans un moule individuel (10);
   b) le pressage du lot (12) dans le moule individuel (10) afin de former un joint cylindrique de fermeture en matière plastique (13);
   c) l'enlèvement du joint de fermeture (13)

du moule individuel (10) et
d) le placement du joint (13) formé individuellement dans un organe de fermeture (14).

**10.** Procédé selon la revendication 9, caractérisé en ce que l'étape a) est réalisée sur une première tourelle rotative (3), en ce que l'étape b) est réalisée sur une seconde tourelle rotative (4) et en ce que l'étape c) est réalisée sur une troisième tourelle rotative (5).

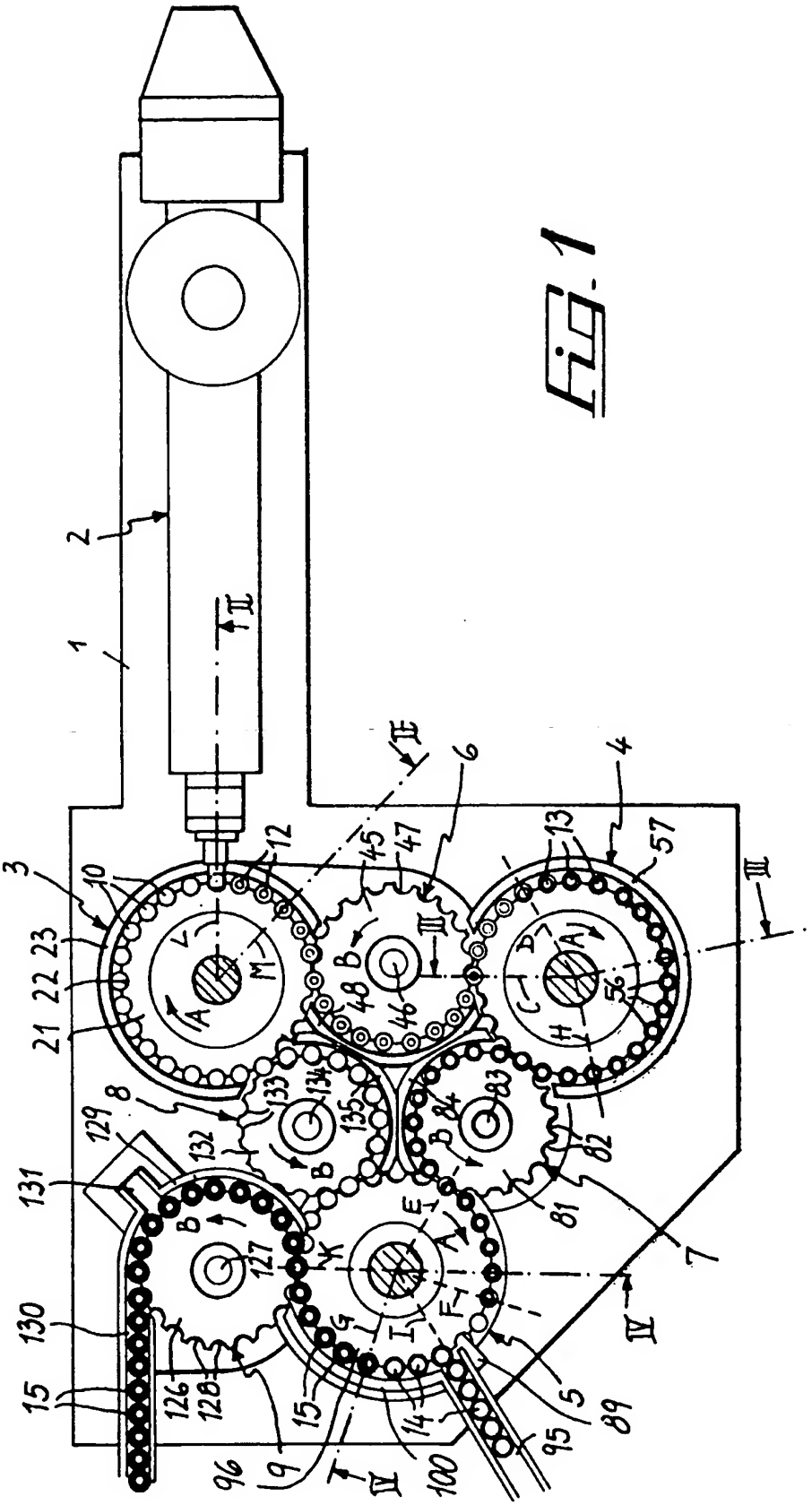

Fig. 1

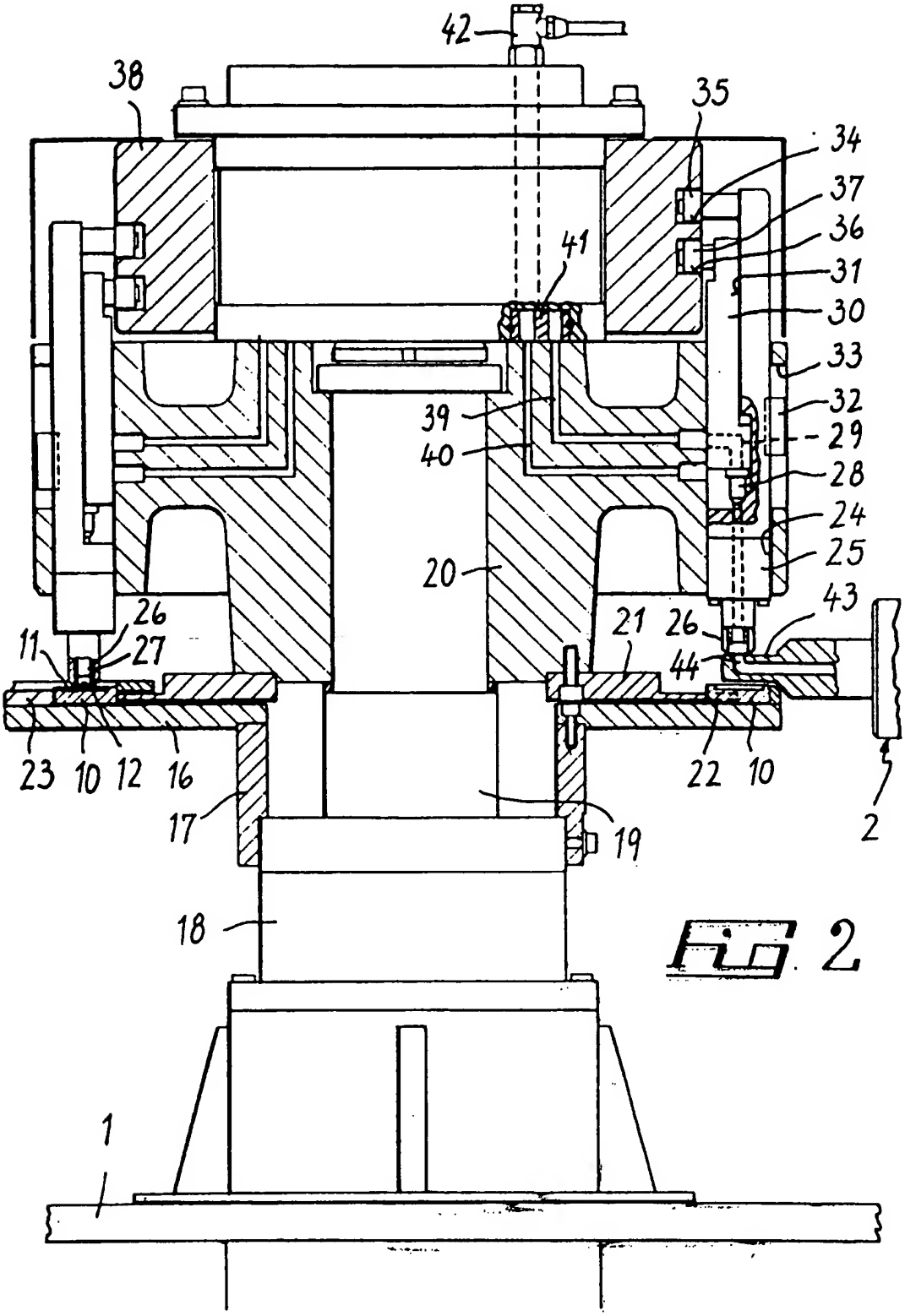
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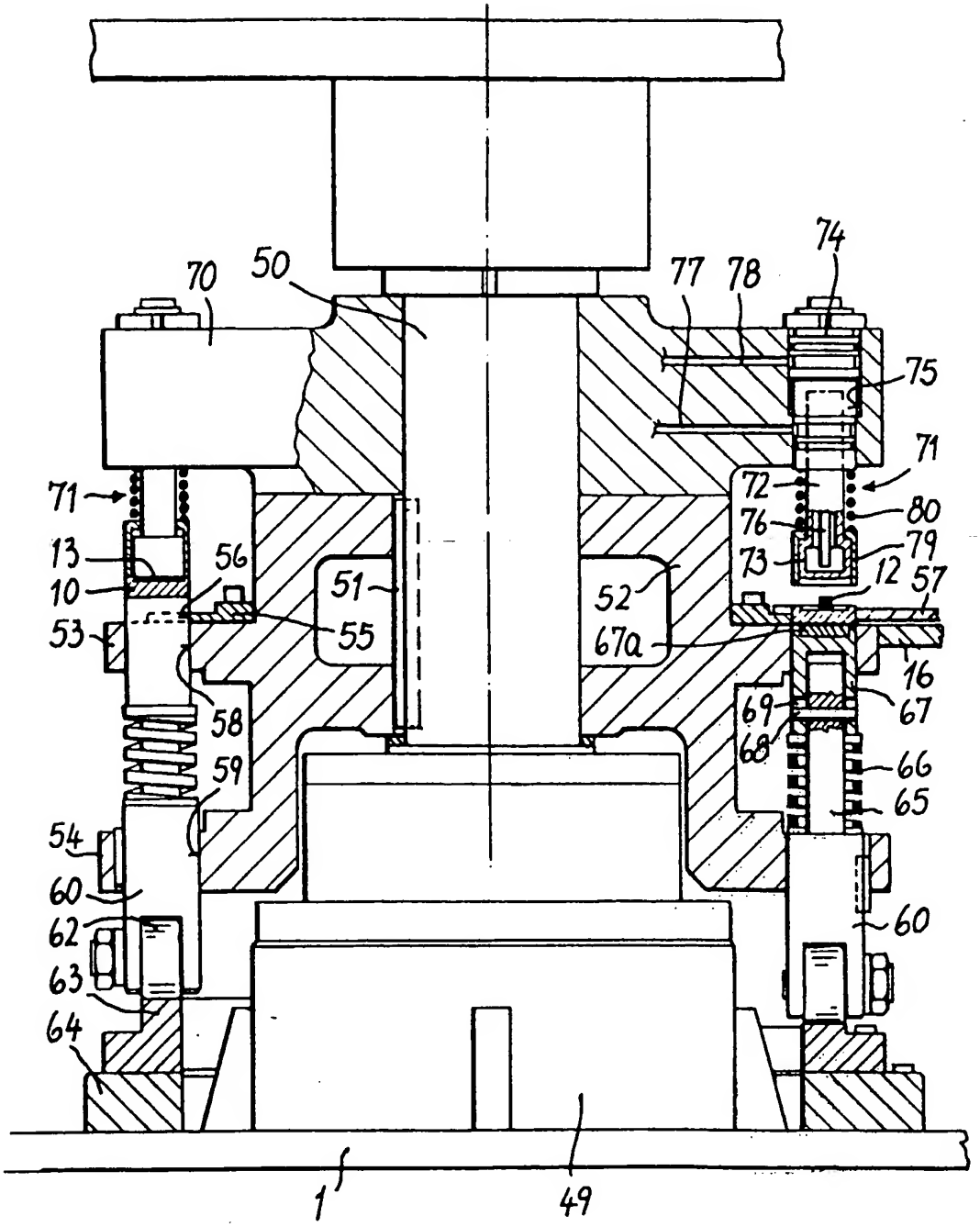
Fig. 2

Fig. 3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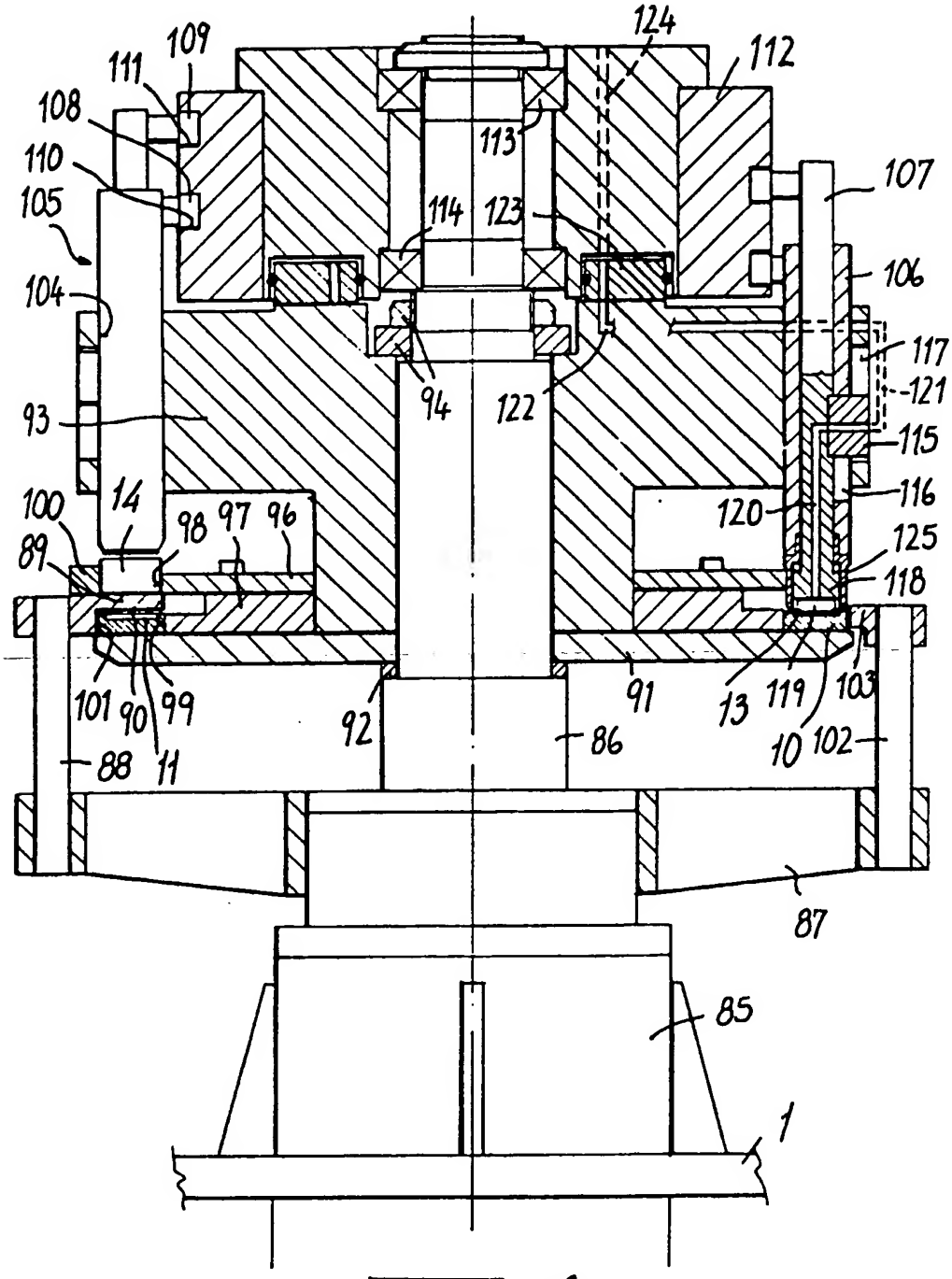
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Fig. 4